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## EUROPEAN PATENT APPLICATION

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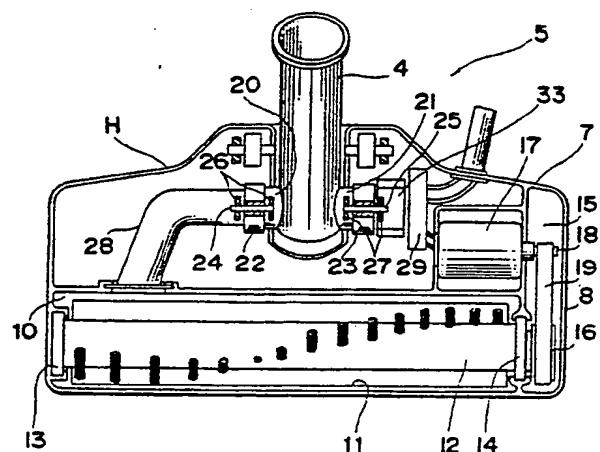
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㉓ Floor nozzle for vacuum cleaner.

㉔ A floor nozzle for a vacuum cleaner which includes a housing (H), and an agitator (12), a driving motor (17) for the agitator (12), and a switch (29) for changing over rotating directions of the motor (17) which are accommodated in the housing (H), and a coupling pipe (4) connected to the housing (H) so as to be displaceable at least back and forth, and communicated with a suction passage to a vacuum cleaner main body (1), and an associating device (33) for transmitting the back and forth displacement of the coupling pipe (4) to the switch (29). The associating device (33) is adapted to be held at two stabilized positions with respect to a boundary dead point and provided with a movable member (35) arranged to be displaced through quick action, to one of the stabilized positions after passing through the dead point, with the movable member (35) being associated with the switch (29).

Fig. 2



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present invention, there is provided a floor nozzle for a vacuum cleaner, which includes a housing, and an agitator, a driving motor for the agitator, and a switch for changing over rotating directions of said motor which are accommodated in said housing, a coupling pipe connected to said housing so as to be displaceable at least back and forth, and communicated with a suction passage to a vacuum cleaner main body, and an associating means for transmitting the back and forth displacement of said coupling pipe to said switch. The associating means is adapted to be held at two stabilized positions with respect to a boundary dead point and provided with a movable member arranged to be displaced through quick action, to one of the stabilized positions after passing through said dead point, with the movable member being associated with the switch.

By the above arrangement according to the present invention, an improved floor nozzle for a vacuum cleaner has been presented, with substantial elimination of disadvantages inherent in the conventional floor nozzles of this kind.

#### BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and features of the present invention will become apparent from the following description taken in conjunction with the preferred embodiment thereof with reference to the accompanying drawings, in which;

Fig. 1 is a perspective view of an electric vacuum cleaner to which a floor nozzle according to the present invention may be applied.

Fig. 2 is a horizontal cross section showing on an enlarged scale, the floor nozzle according to one preferred embodiment of the present invention.

Fig. 3 is an exploded perspective view of a motor rotating direction change-over mechanism employed in the floor nozzle of Fig. 2.

Fig. 4 is a diagram for explaining functions of a ring member for pivotally supporting a coupling pipe for the floor nozzle of Fig. 2.

Fig. 5 is a schematic side sectional view for explaining functions of an associating means employed in the floor nozzle of Fig. 2, and

Fig. 6 is an electrical circuit diagram for the floor nozzle of Fig. 2.

#### DETAILED DESCRIPTION OF THE INVENTION

Before the description of the present invention proceeds, it is to be noted that like parts are designated by like reference numerals throughout the accompanying drawings.

Referring now to the drawings, there is shown

in Fig. 1, an electric vacuum cleaner to which a floor nozzle 5 directly related to the present invention may be applied.

5 In Fig. 1, the vacuum cleaner generally includes a cleaner main body 1 in which a fan motor for air suction and a filter unit for filtering and collecting dust in the suction air, etc. (not particularly shown) are incorporated, an extension pipe 3 connected to a suction side of the main body 1 through a hose 2, and the floor nozzle 5 connected to the forward end of the extension pipe 3 through a coupling pipe 4. Energization of the floor nozzle 5 is arranged to be effected from the side of the cleaner main body 1 through a spiral reinforcing wire provided in the hose 2 and a cord 6 disposed along the outer side wall of the extension pipe 3.

10 Referring also to Fig. 2, the floor nozzle 5 includes a housing H constituted by upper and lower casings 7 and 8 combined with each other, and a bumper 9 made of an elastic material such as rubber or the like and covering the combined portion therebetween.

15 More specifically, the floor nozzle 5 has a suction chamber 10 laterally formed at its forward inner portion, and open into the lower casing 8 to provide a suction port 11. In the suction chamber 10, there is provided an agitator 12 rotatably supported by bearing portions 13 and 14 formed in the housing H and having a large diameter pulley 16 at its one end facing a belt chamber pulley 16 at its one end facing a belt chamber 15 formed at one side of the floor nozzle 5. In a position at the back of the suction chamber 10 and deviated towards the side of the belt chamber 15, a DC motor 17 is provided, with a belt 19 for power transmission being directed around a shaft 18 of said motor 17 extending into the belt chamber 15 and the large diameter pulley 16 of the agitator 12. In other words, it is so arranged that by the difference in the diameters of the shaft 18 and the pulley 16, the rotation of the motor 17 is transmitted to the agitator 12 through reduction in speed.

20 Meanwhile, the coupling pipe 4 provided at the forward end portion of the extension pipe 3 is closed at its forward end, and formed with support pipes 20 and 21 laterally projecting therefrom so as to have a generally T shape on the whole. The support pipe 20 at one side is open at its end face, while the support pipe 21 at the other side is closed at its end face. These support pipes 20 and 21 are rotatably fitted in ring members 22 and 23, which are respectively, rotatably suspended from the upper casing member 7 of the floor nozzle 5 through pins 24 and 25 so as to effect a pendulum motion. Ribs 26 and 27 are formed on the upper and lower casings 7 and 8 to support said pins 24 and 25.

25 Accordingly, the coupling pipe 4 supported by

sucking characteristic of the floor nozzle may be improved by that extent.

Moreover, if an initial rotating direction setting switch (not particularly shown) for arbitrarily setting the initial rotating direction of the motor 17 is separately provided, it is also possible to set the rotating direction of the agitator 12 to be in the forward or opposite direction with respect to the movement of the floor nozzle 5 in the course of the cleaning work.

The above function is significant for effecting cleaning suitable for actual conditions, for example, such that during cleaning work in which the agitator 12 is being rotated in the forward direction with respect to the moving direction of the floor nozzle 5 in order to reduce the operating force, if a portion heavily soiled is found at part of the carpet, the agitator 12 may be temporarily rotated in the opposite direction for positively removing such soiling.

As is clear from the foregoing description, according to the floor nozzle of the present invention, since the actuator 30 of the switch 29 is associated with the intermediate point 40 of curvature of the plate spring 35 without any vertical displacement, such associated portion is free from generation of twisting force, whereby the change-over function of the switch 29 and inversion displacement of the plate spring 35 may be effected smoothly. Moreover, since the inversion of the plate spring 35 is effected through quick action, arc generation at the contact portions of the switch 29 may be suppressed.

Furthermore, owing to the arrangement that the plate spring 35 is held at either one of the two stabilized positions, there is no possibility that the switch 29 remains in OFF state, and thus, malfunctions of the motor and consequently, of the agitator can be prevented.

Even when the inversion of the plate spring 35 should be undesirably locked by some causes, since the acting piece 36 is arranged to be merely subjected to the elastic displacement, damages, for example, to the actuator 30 of the switch 29 can be advantageously prevented.

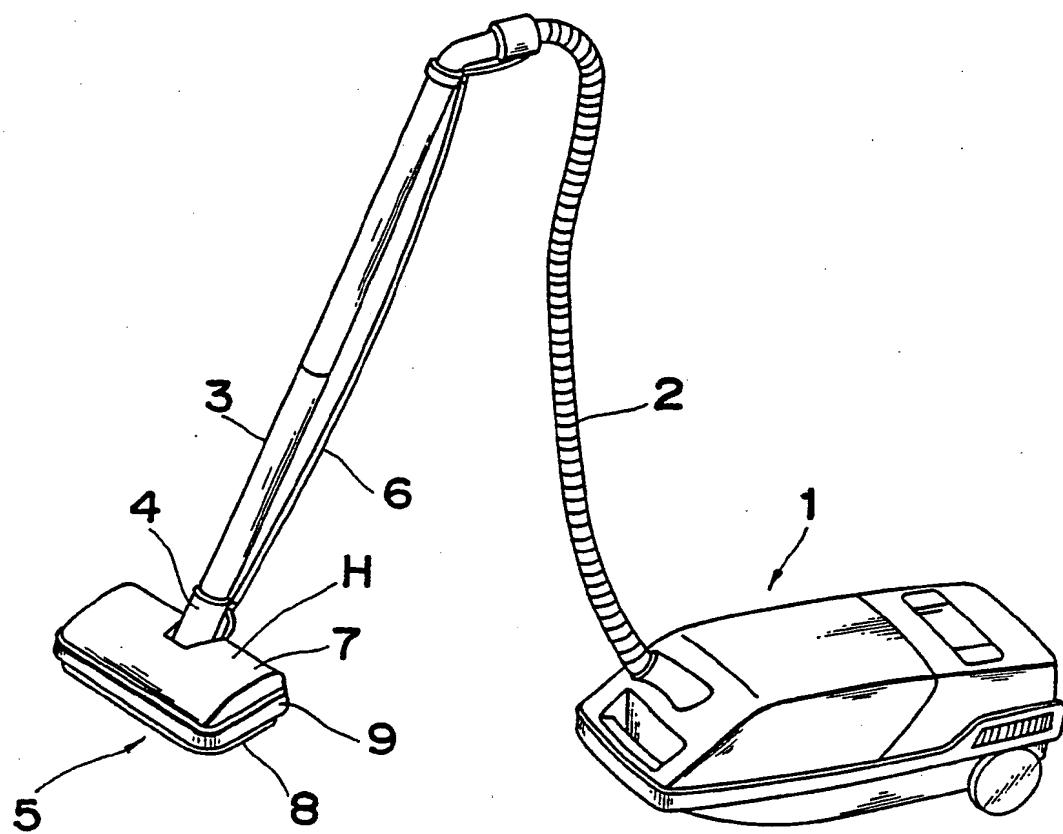
It should also be noted that, in the foregoing embodiment, although the plate spring is employed for the quick acting inversion mechanism, such plate spring may be replaced, for example, by a combination of a coil spring and a lever.

Although the present invention has been fully described by way of example with reference to the accompanying drawings, it is to be noted here that various changes and modifications will be apparent to those skilled in the art. Therefore, unless otherwise such changes and modifications depart from the scope of the present invention, they should be construed as included therein.

## Claims

1. A floor nozzle for a vacuum cleaner which comprises a housing (H), and an agitator (12), a driving motor (17) for the agitator (12), and a switch (29) for changing over rotating directions of said motor (17) which are accommodated in said housing (H), a coupling pipe (4) connected to said housing (H) so as to be displaceable at least back and forth, and communicated with a suction passage to a vacuum cleaner main body (1), and an associating means (33) for transmitting the back and forth displacement of said coupling pipe (4) to said switch (29), said associating means (33) being adapted to be held at two stabilized positions with respect to a boundary dead point and provided with a movable member (35) arranged to be displaced, through quick action, to one of the stabilized positions after passing through said dead point, said movable member (35) being associated with said switch (29).
2. A floor nozzle as claimed in Claim 1, wherein rotating direction of said agitator (12) is set so as to be in a forward direction with respect to advancing or retreating function of the floor nozzle.
3. A floor nozzle as claimed in Claim 1, wherein rotating direction of said agitator (12) is set so as to be in an opposite direction with respect to advancing or retreating function of the floor nozzle.
4. A floor nozzle as claimed in Claim 1, wherein said movable member (35) for said associating means (33) is constituted by a plate spring which is held by a holding means (34) at intervals, with a portion of the plate spring between holding points thereof being resiliently curved.
5. A floor nozzle as claimed in Claim 1, wherein an actuator (30) for said switch (29) is associated with an intermediate point of curvature of said movable member (35) constituted by a plate spring.
6. A floor nozzle as claimed in Claim 4, wherein an actuator (30) for said switch (29) is associated with an intermediate point of curvature of said plate spring (35).
7. A floor nozzle as claimed in Claim 1, wherein one end of said movable member constituted by a plate spring (35) is further extended from the holding point to form an acting piece (36), with which a back and forth displacing member of said coupling pipe (4) is associated.
8. A floor nozzle as claimed in Claim 4, wherein one end of said plate spring (35) is further extended from the holding point to form an acting piece (36), with which a back and forth displacing member of said coupling pipe (4) is associated.
9. A floor nozzle as claimed in Claim 1, wherein one end of said coupling pipe (4) is pivotally connected to the housing (H) of the floor nozzle.

*Fig. 1*



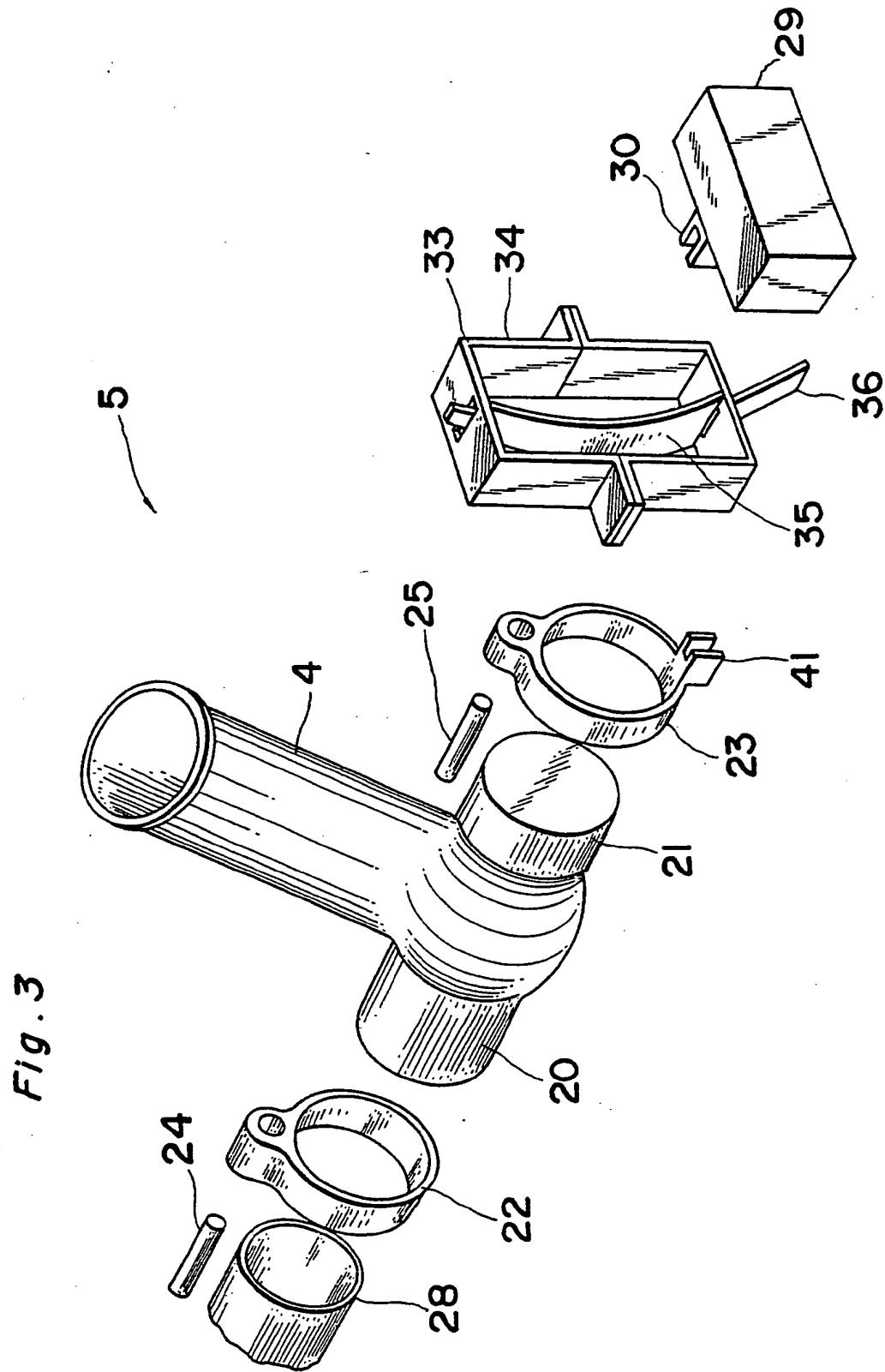
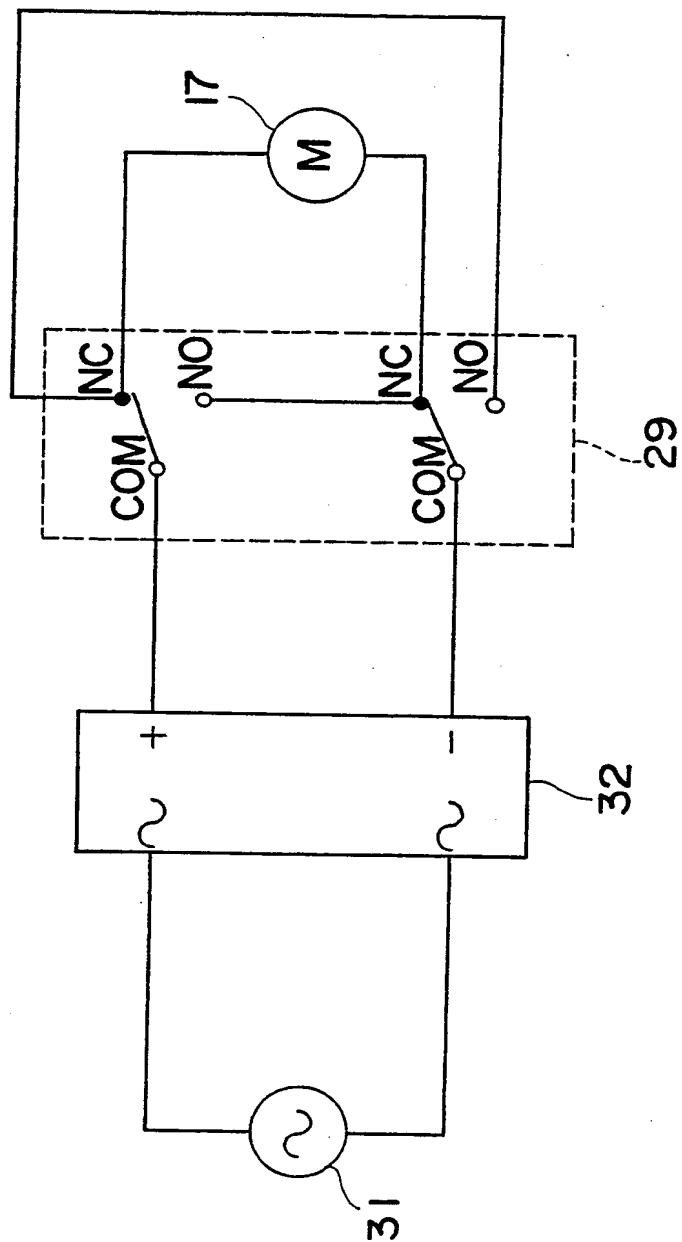


Fig. 3

Fig. 6





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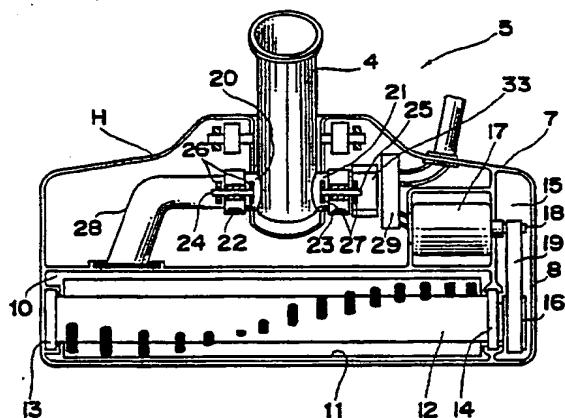
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㉓ **Floor nozzle for vacuum cleaner.**

㉔ A floor nozzle for a vacuum cleaner which includes a housing (H), and an agitator (12), a driving motor (17) for the agitator (12), and a switch (29) for changing over rotating directions of the motor (17) which are accommodated in the housing (H), and a coupling pipe (4) connected to the housing (H) so as to be displaceable at least back and forth, and communicated with a suction passage to a vacuum cleaner main body (1), and an associating device (33) for transmitting the back and forth displacement of the coupling pipe (4) to the switch (29). The associating device (33) is adapted to be held at two stabilized positions with respect to a boundary dead point and provided with a movable member (35) arranged to be displaced through quick action, to one of the stabilized positions after passing through the dead point, with the movable member (35) being associated with the switch (29).

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Fig. 2



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